



# Parking in the Changing Urban Landscape

*New Challenges and  
New Opportunities*

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Presented

*Right-Sizing Commercial Parking*

*Alexandria, Virginia*

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# *Building For People or Cars?*

Automobiles make wonderful servants but terrible masters.

Design your community for people, and then accommodate motor vehicles. Don't design communities for automobile traffic and then try to accommodate people.





# *Redefining Parking Problems*



Parking problems are among the most common complaints businesses and local officials face. They can constrain economic development.

# *Parking Problem?*





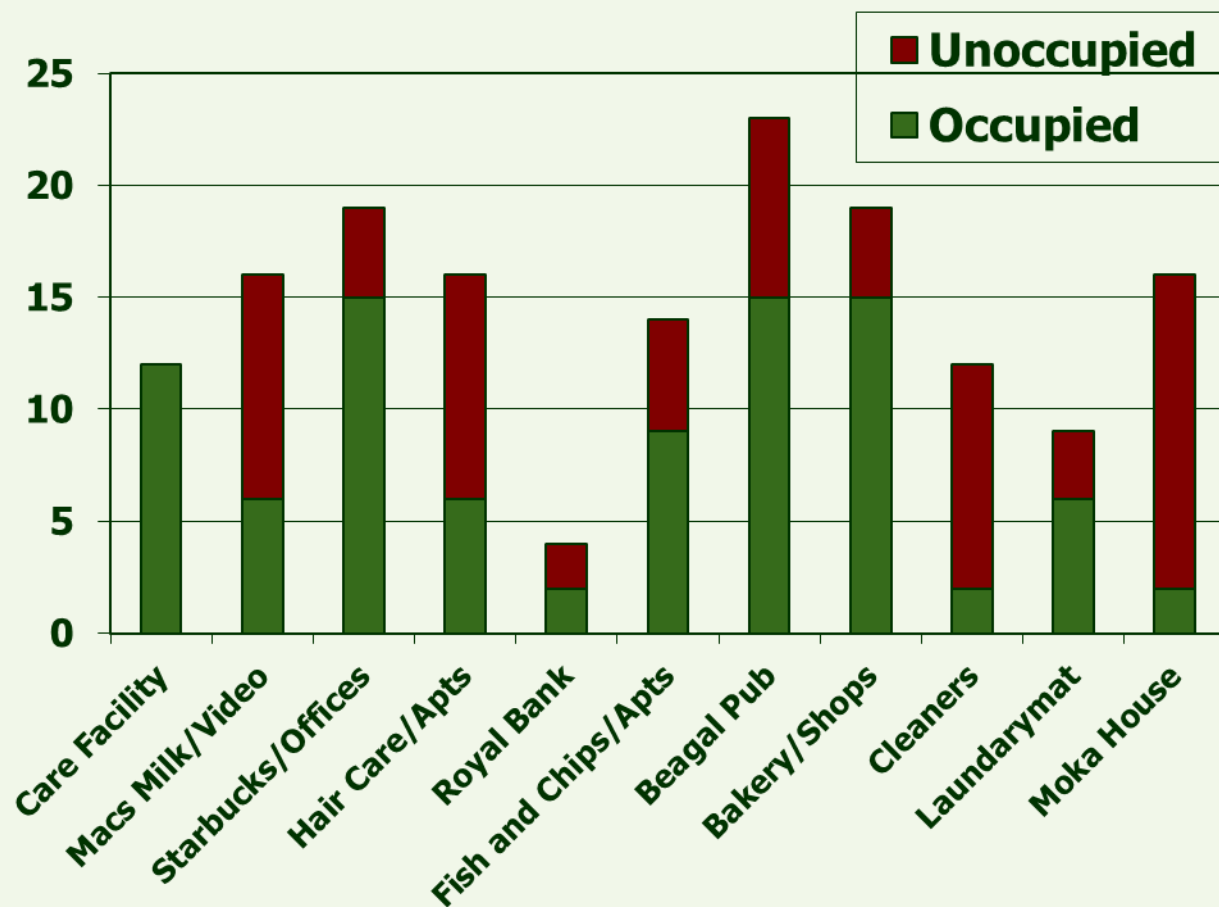
# *Parking Problem?*



# *Cook Street Village Parking Utilization*

## Unoccupied

Weekday Noon: 44%  
Friday Night: 50%  
Saturday Morning: 51%





# *Parking Management Problem*



Many areas don't really have a **parking supply** problem, they have a **parking management** problem - parking spaces that are unavailable to the motorists who need them.

# *New Paradigm – New Solutions*

- The old planning paradigm assumed that, when it comes to parking, more and cheaper is better.
- A new paradigm recognizes that more land devoted to parking means less land available for people and businesses, and that parking is never really free, the choice is between paying directly or indirectly.
- The new paradigm places more emphasis on efficient management, so fewer spaces are needed to serve parking demands.
- The new paradigm expands the range of solutions that can be used to solve parking problems.
- Every situation is unique, so parking policies must be flexible and dynamic in order to respond to specific and changing needs.





# *Old and New Paradigms*

Old Paradigm	New Paradigm
<i>Parking problem</i> means inadequate parking supply.	There are many types of parking problems, including inadequate or excessive supply, inadequate user information, and inefficient management
Parking should generally be free, funded indirectly, through rents and taxes.	Users should pay directly for parking facilities when possible
Parking should be available on a first-come basis	Parking should be regulated to favor higher priority uses and encourage efficiency
Parking management is a last resort, to be applied only if increasing supply is infeasible	Parking management programs should be widely applied to prevent parking problems
<i>Transportation</i> means driving	Driving is just one type of transport

# *How Big is a Parking Space?*

- A typical large personal vehicle (pickup truck, SUV or van) is 18+ feet long and 7+ feet wide.
- Including “shy distance” for maneuvering and opening doors, it requires a parking space more than 20 feet long and 10 feet wide.

Specifications

LENGTH 18ft 4.6in

WIDTH 7ft 2.3in

HEIGHT 6ft 6.5in

GROUND CLEARANCE 0ft 9.5in

Body style illustration may not reflect the actual shape of this vehicle.

Exterior Measurements

WIDTH	7 ft. 2.3 in. (86.3 in.)	HEIGHT	6 ft. 6.5 in. (78.5 in.)
LENGTH	18 ft. 4.6 in. (220.6 in.)	GROUND CLEARANCE	0 ft. 9.5 in. (9.5 in.)
FRONT TRACK	6 ft. 1.6 in. (73.6 in.)	REAR TRACK	6 ft. 1.6 in. (73.6 in.)
WHEEL BASE	11 ft. 1.3 in. (133.3 in.)		

Interior Measurements

FRONT HEAD ROOM	41.0 in.	FRONT HIP ROOM	60.5 in.
FRONT LEG ROOM	41.4 in.	FRONT SHOULDER ROOM	65.9 in.
REAR HIP ROOM	65.4 in.	REAR HEAD ROOM	39.7 in.
REAR LEG ROOM	33.4 in.	REAR SHOULDER ROOM	65.7 in.

Fuel

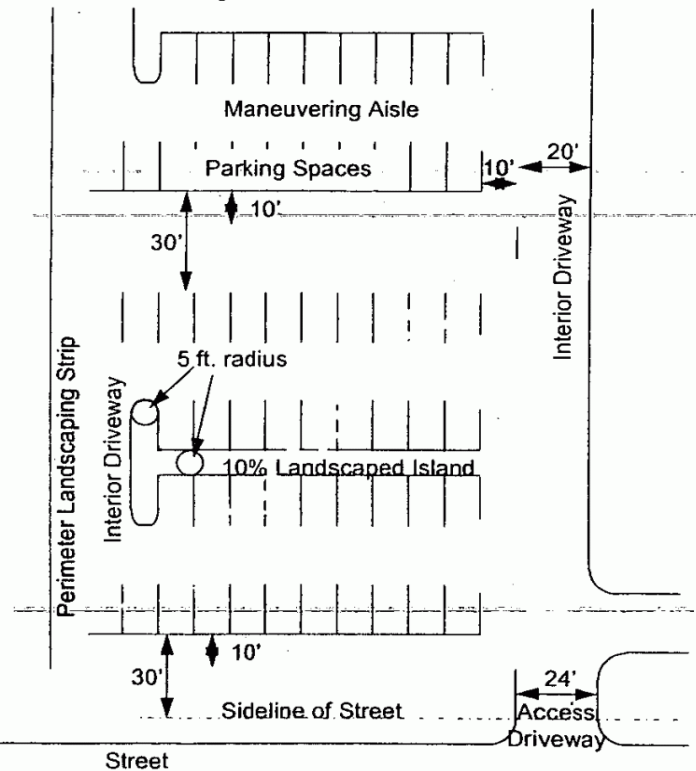
ENGINE TYPE	Gas	FUEL TYPE	Regular unleaded
FUEL TANK CAPACITY	26.0 gal.	RANGE IN MILES (CTY/HWY)	286.0/416.0 mi.
EPA MILEAGE EST. (CTY/HWY)	11/16 mpg		



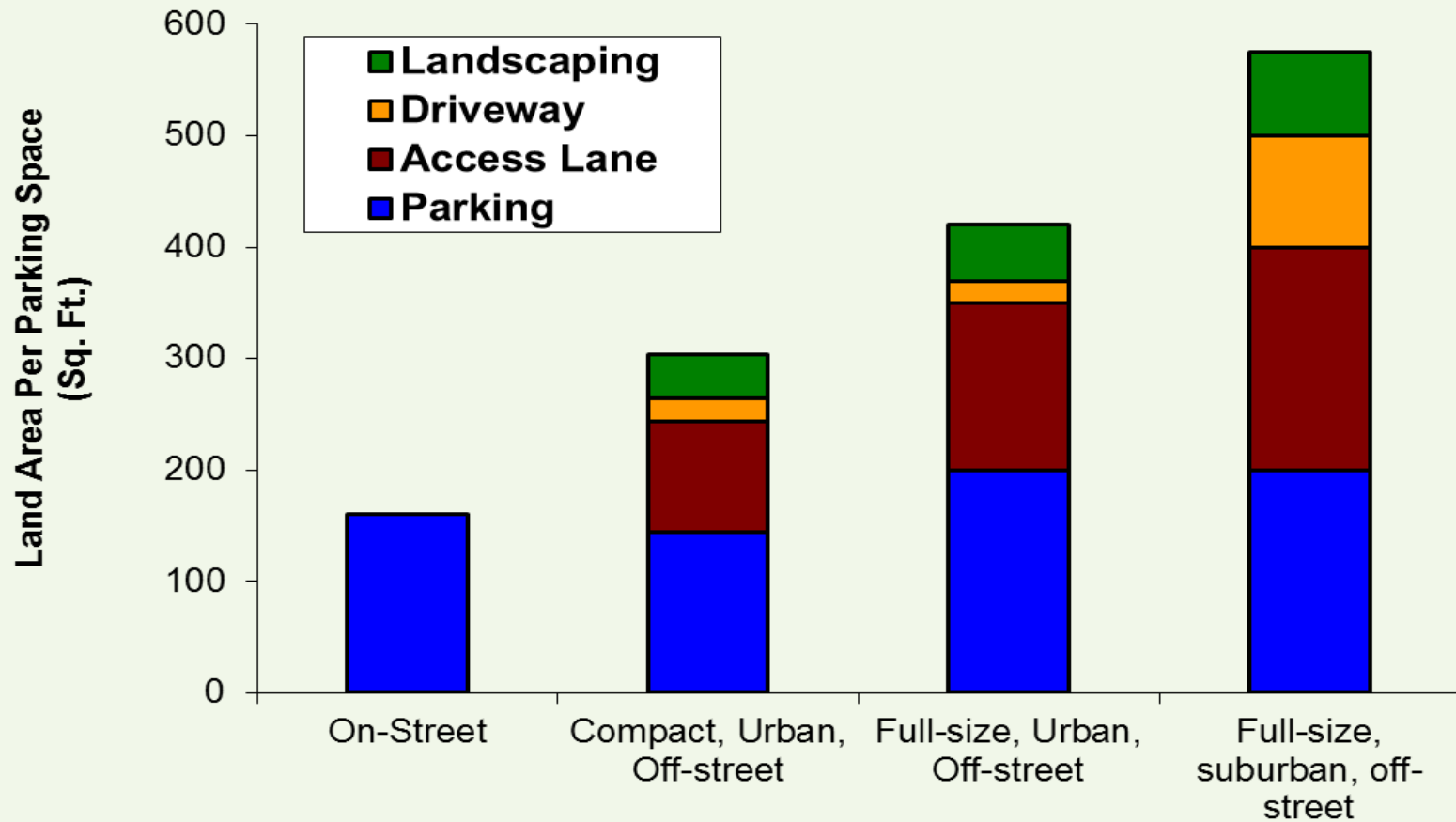
# *How Much Land?*

- A typical parking space is 18-22 feet long and 8-12 feet wide, totaling 144-240 square feet. Off-street parking typically requires 250-400 square feet per space, including access lanes and landscaping, allowing 100-175 spaces per acre.
- Conventional parking requirements typically range from 1 to 5 spaces per 1,000 square feet of commercial space, which requires 0.3 to 1.5 square feet of parking for each square foot of commercial space.

## Example for Parking Lot Design Requirements



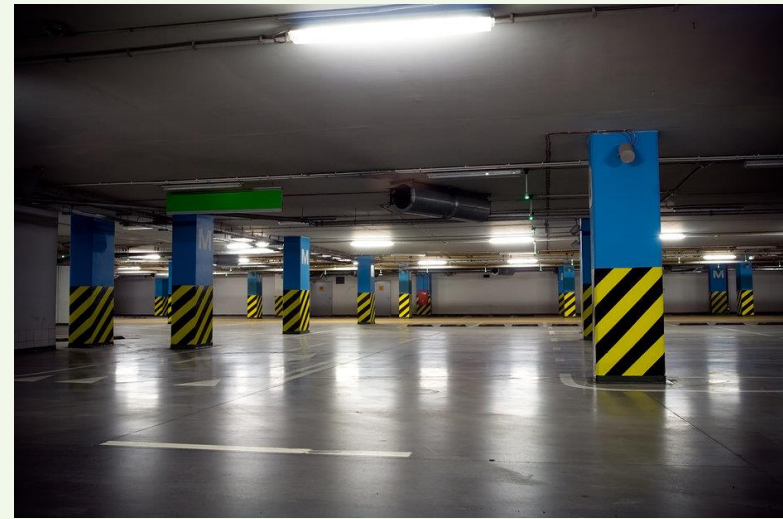
# *Parking Land Requirements*



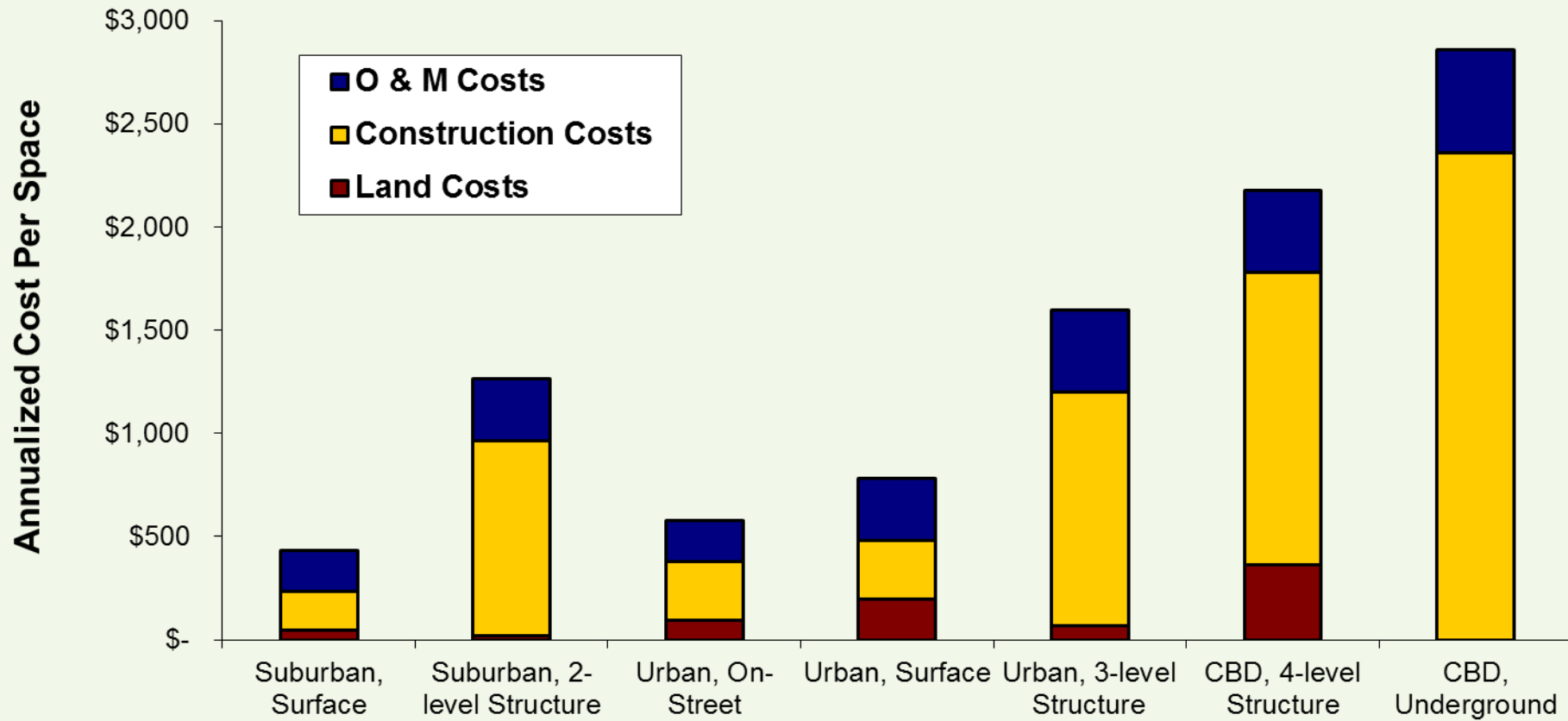


# *What Does a Parking Space Cost?*

- Surface parking requires land plus \$5,000-10,000 per space to construct.
- Structured and underground parking require less land but costs \$20,000-60,000 to construct. Structured parking typically becomes cost effective when land values exceed \$2-4 million per acre.
- Including land, construction and operating costs, urban parking spaces typical cost \$1,000-3,000 annually.
- Motorists want convenient parking, as long as somebody else pays, but when asked to pay directly often prefer less convenient but cheaper options.



# *Parking Facility Costs*





# *Parking Spaces Per Vehicle*

- **3-5** parking spaces per vehicle.
- Annualized cost per space:
  - Surface = **\$500-1,500**
  - Structured = **\$1,500-3,000**
- **\$2,000 to \$8,000** total annualized cost per vehicle
- May parking space are worth more than the vehicles they serve
- Most vehicles are worth less than the total value of parking spaces they use.
- For every dollar motorists spend on their vehicles, somebody spends more than a dollar to subsidize its parking.



# *Tax Revenue*

Municipal property tax yield (per acre) in Raleigh, NC, 2011<sup>29</sup>





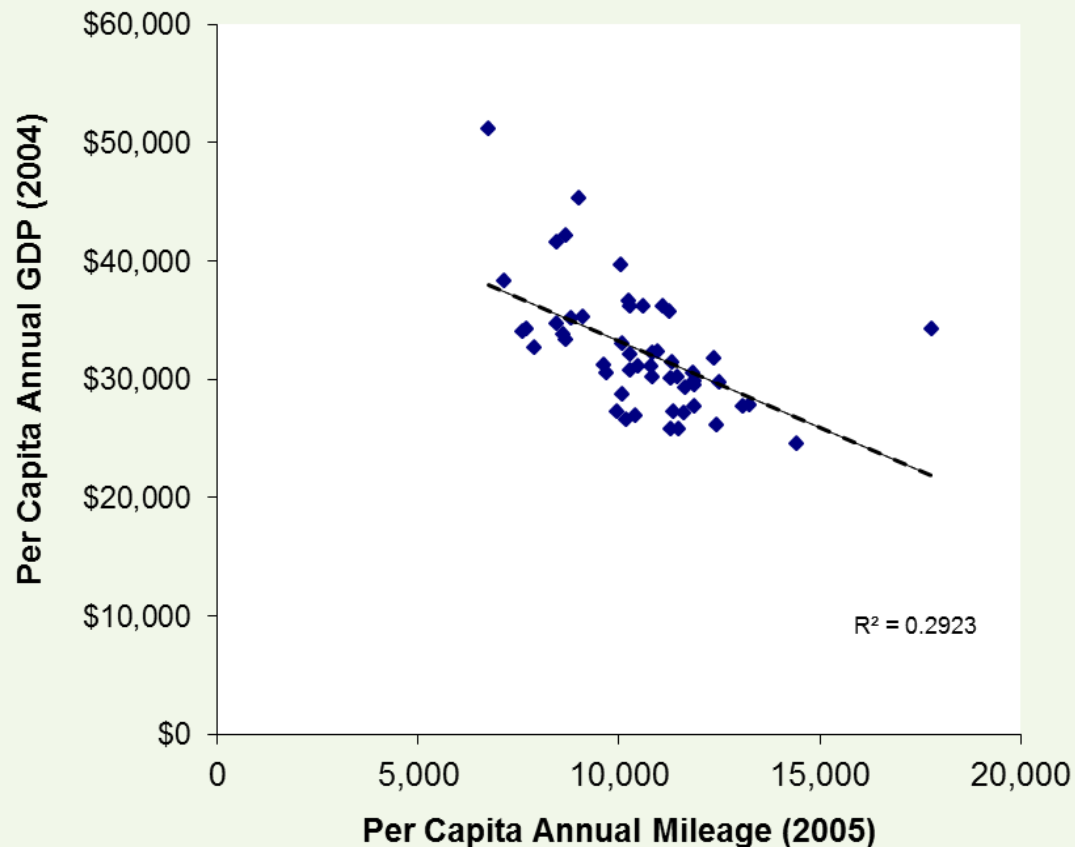
# *Economic Benefits*

Currently, about half of the 11.4 acre Landark Mall is devoted to parking. With better parking management it can be transformed into a vibrant open-air, mixed-use urban village with retail, entertainment, multi-family housing, plazas and green spaces, and updated transit center.

- More jobs
- More business activity
- More tax revenue
- Better economic opportunity for disadvantaged residents



# *Regional Economic Development*



Per capita economic productivity tends to increase as vehicle travel declines. (Each dot is a U.S. state.)

This and other research indicate that many of the factors that encourage automobile travel are overall economically harmful, and Transit Oriented Development tends to increase economic productivity by reducing per capita vehicle travel and associated costs.



# *Past Visions of Future Transport*



1949 ConvAIRCAR Flying Car



1958 Firebird



Segways

# *2001 A Space Odyssey*



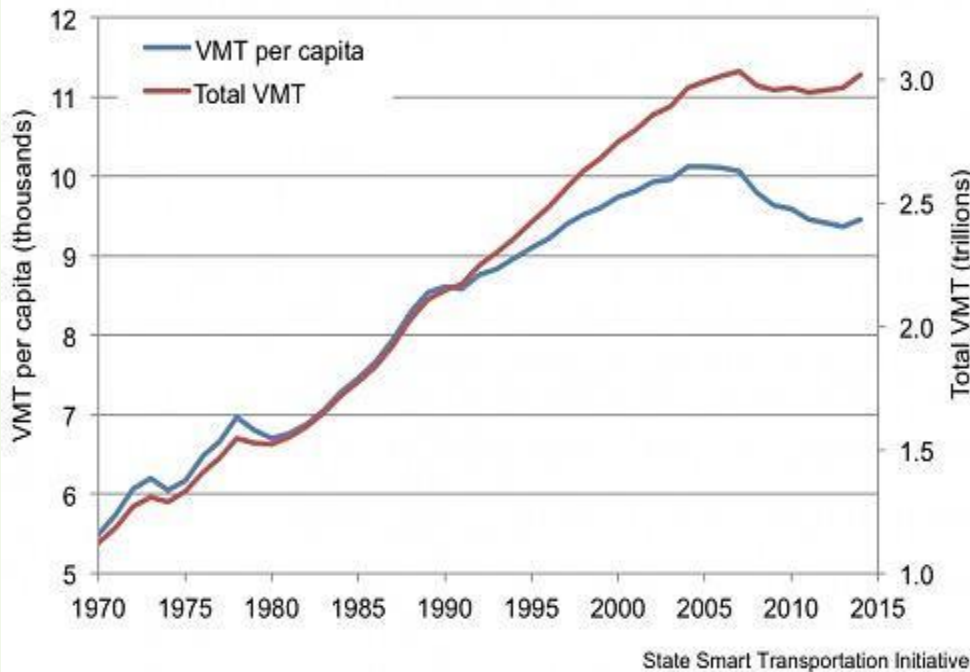
# *Wheeled Luggage*





# *Motor Vehicle Travel is Peaking*

## Annual Vehicle Mileage



*Vehicle travel grew steadily during the Twentieth Century but stopped about 2003.*

- Vehicle travel saturation
- Aging population
- Increased urbanization
- Increased traffic and parking congestion
- Improved mobility options (walking, cycling, transit, carsharing, ride hailing, etc.)
- Changing consumer preferences
- Health concerns
- Environmental concerns

# *Parking Management*

*Parking Management* consists of various strategies that result in more efficient use of existing parking resources.





# *The Future of Automobile Travel*

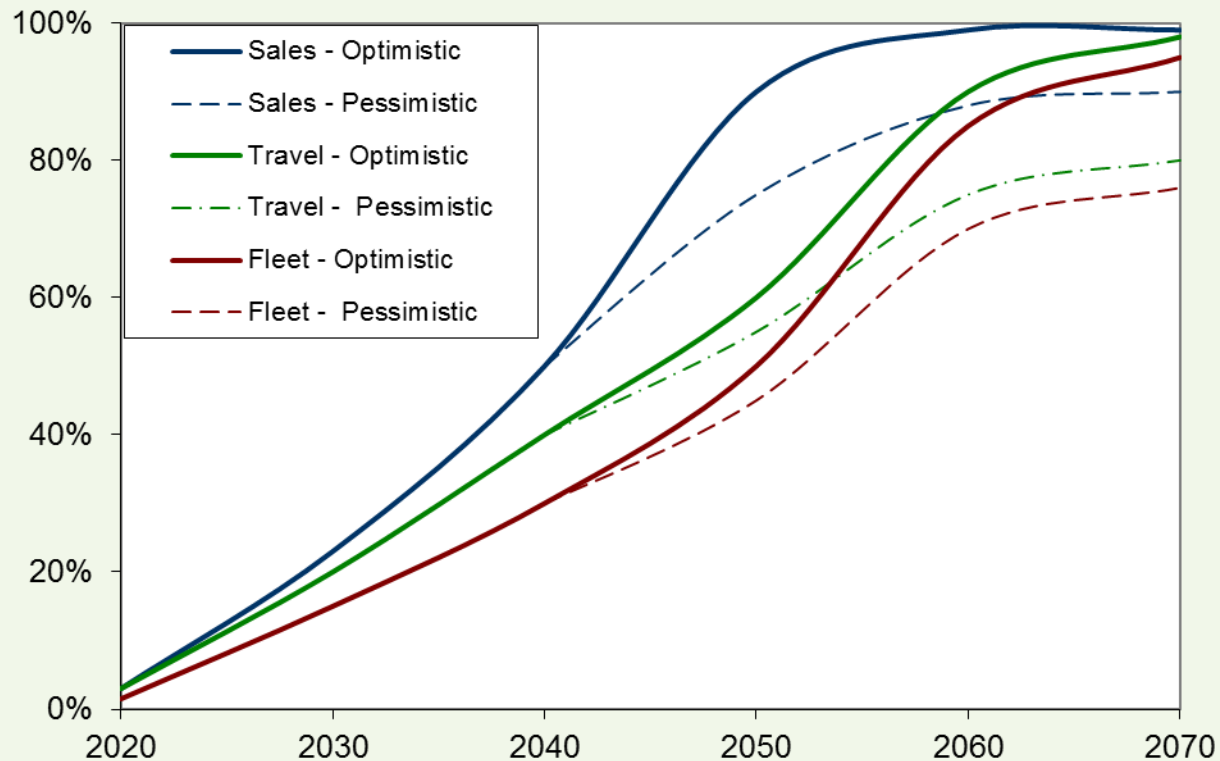


How will autonomous vehicles affect people's lives, and transport planning issues such as roadway and parking supply requirements, and crash rates?



# *Implementation Projections*

If autonomous vehicle implementation follows the patterns of other vehicle technologies it will take one to three decades to dominate vehicle sales, plus one or two more decades to dominate vehicle travel, and even at market saturation it is possible that a significant portion of vehicles and vehicle travel will continue to be self-driven, indicated by the dashed lines.



# *Many Factors Affect Future Demands*

## Demographic Trends

Aging population  
More working at home  
Reduced youth drivers' license

## Price Changes

Rising fuel prices  
Efficient road & parking pricing

## Improved Travel Options

Better walking and cycling  
Improved public transit  
Telework and delivery services  
Carsharing

## Changing User Preferences

Less driving  
Shared rather than personal vehicles  
More walking & cycling  
More urban living

## Intelligent Transport Systems (ITS)

Improved user information/navigation  
Electronic pricing  
**Autonomous vehicles**

## Planning Innovations

Expanded objectives  
Systems operations  
Demand management

# *Why Parking Management?*

**In the past, parking planning mainly involved regulations and subsidies to increase supply.**

**Now more efficient management is increasingly used to address parking problems, particularly in growing communities and downtowns areas.**

- Improves motorist convenience.
- Creates more attractive streetscapes.
- Housing affordability.
- Downtown redevelopment.
- More walkable communities.
- Economic development.
- Reduced pavement.
- Encourages walking, cycling and public transit use.



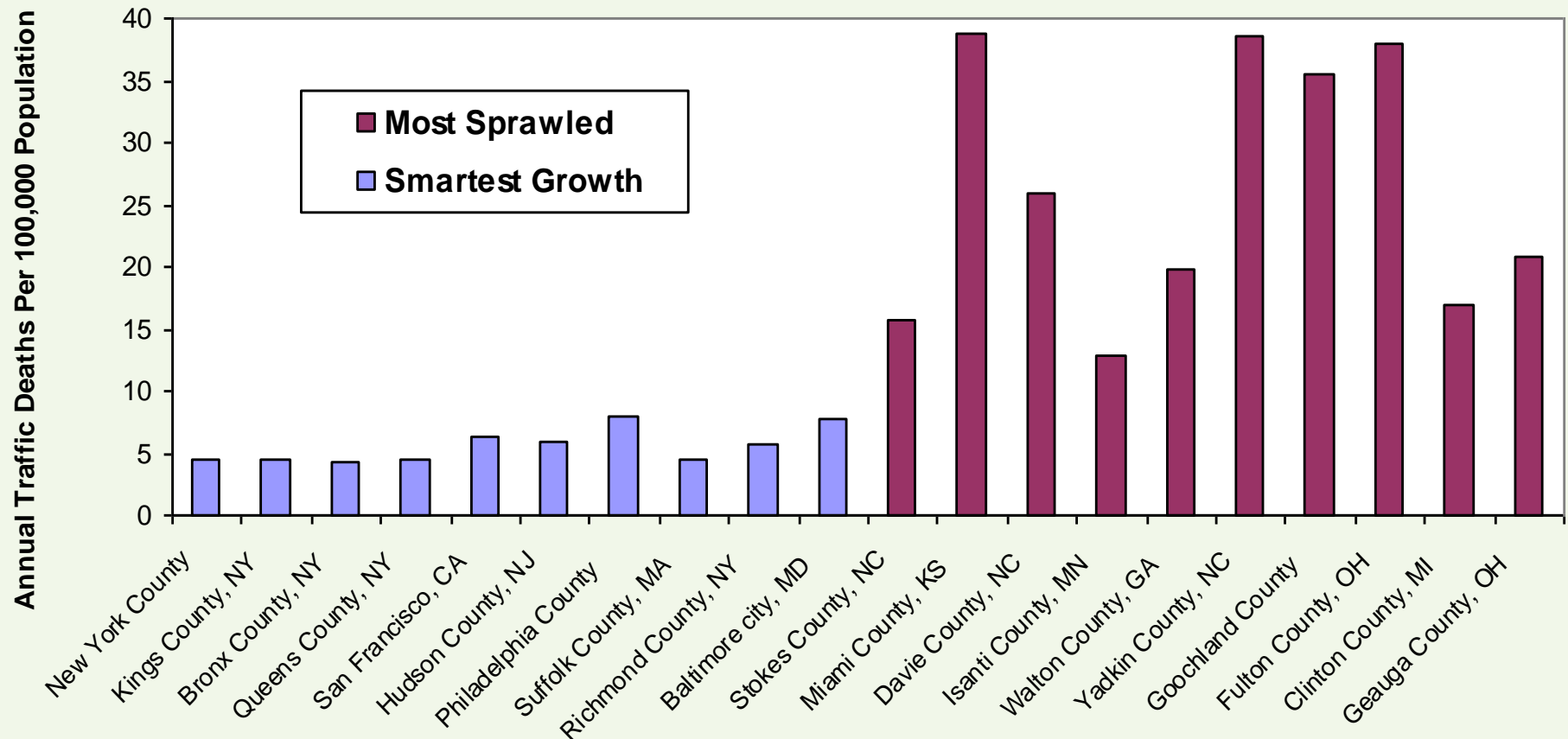
# *Impacts on Affordability*



## **Increases Affordability**

- Reduced parking facility costs (particularly if structured).
- Higher density reduces land requirements per unit.
- Allows more infill, redevelopment and design flexibility.
- Allows more diverse, affordable housing options (secondary suites, rooms over shops, loft apartments).

# *Traffic Safety and Health*

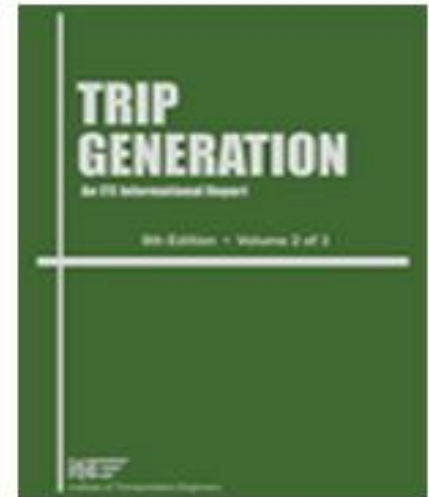


*The most sprawled counties have about four times the traffic fatality rates as the Smartest Growth counties.*

# *Trip and Parking Generation Models*

Reports such as these are often used to predict the number of trips and that demand for parking that will be “generated” at a particular development or area.

Such predictions significantly affect planning decisions, such as traffic impact fees and minimum parking requirements.



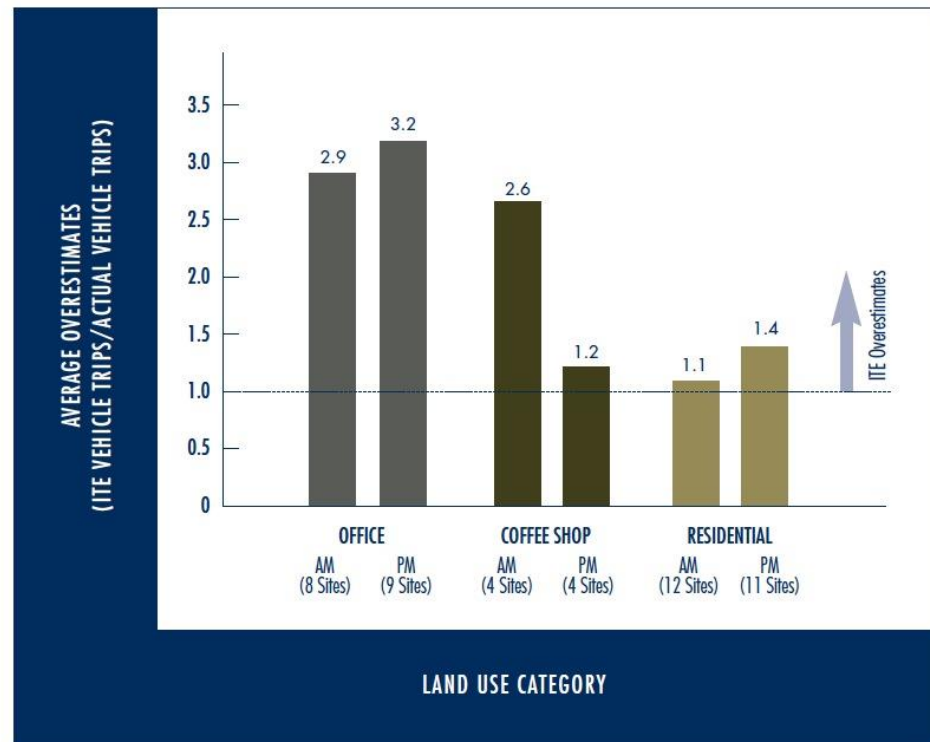


# *Improving Demand Analysis*

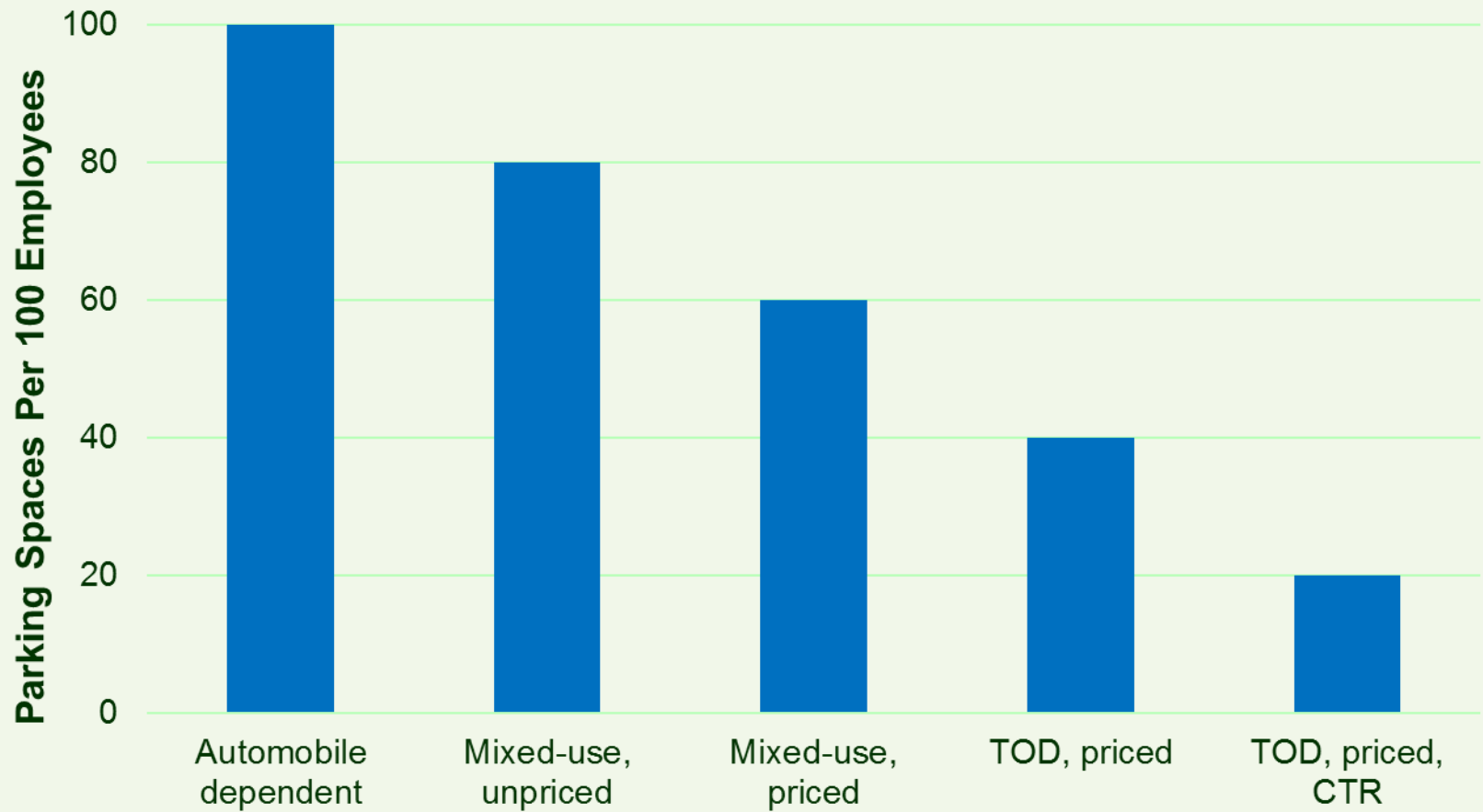
"Trip Generation for Smart Growth Projects" (Schneider, Handy and Shafizadeh 2014) found that commonly-used trip generation prediction models overestimate smart growth development trip generation rates by an average of 2.3 times. Most of these findings are transferable to parking generation analysis.

**FIGURE 1**

ITE Rate vs. Actual  
Vehicle Trips at Smart  
Growth Sites

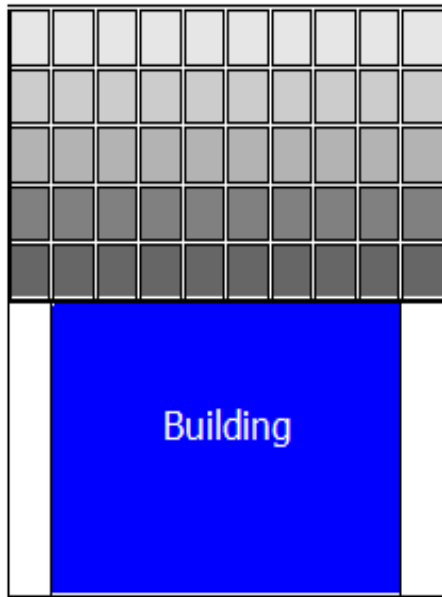


# *Parking Spaces Needed*



# *More Accurate Demand Analysis*

For example, rather than saying, “A 12,500sf commercial building requires 50 spaces,” a planner could say that it needs:



50 spaces at an automobile-oriented location, unmanaged and unpriced.  
40 spaces at a multi-modal location, unmanaged and unpriced.  
30 spaces at a multi-modal location, managed efficiently and unpriced.  
20 spaces at a multi-modal location, managed efficiently and \$2 per day.  
10 spaces at a multi-modal location, managed efficiently and \$5 per day.

This recognizes that the number of parking spaces demanded can vary significantly depending on factors such as the location, quality of travel options available, and how parking facilities are managed.

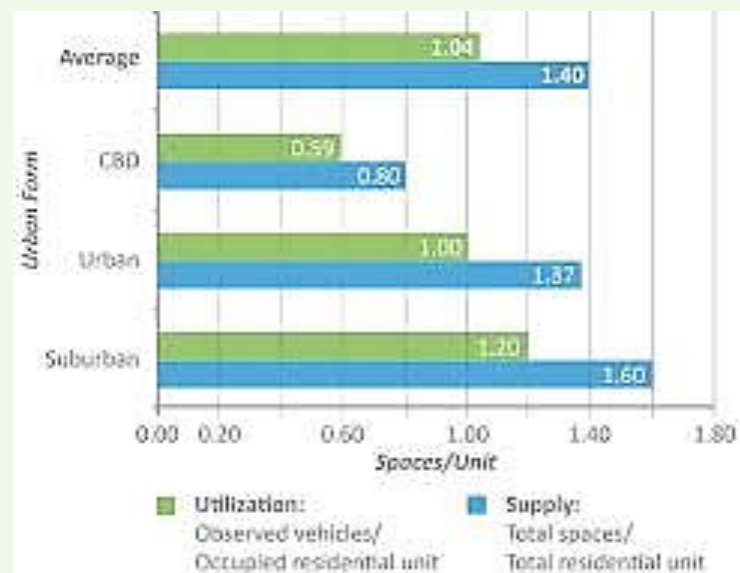




# *Excessive Requirement Costs*

Oversupply of parking adds unnecessary project costs and inefficient land use:

- Excess surface parking can add \$2 per foot to annual unit leasing cost (@ \$8,000 per stall)
- Excess garage parking can add \$6.00 - \$7.00 per foot to annual unit leasing cost (@ \$30,000 per stall)
- For a typical affordable housing development, adding one space per unit increases leasing costs about 12.5%; adding two parking spaces increases leasing costs about 25%.

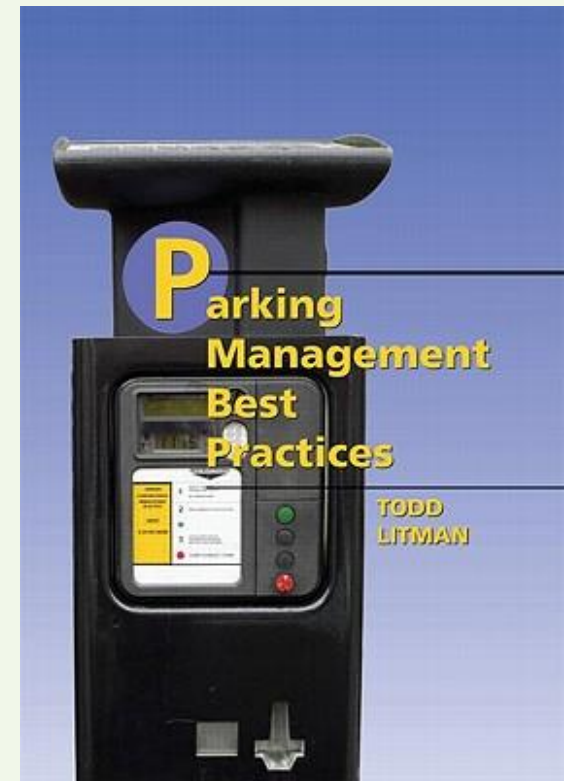


## *Seattle Right Size Parking Study*

<http://metro.kingcounty.gov/programs-projects/right-size-parking/pdf/rsp-final-report-8-2015.pdf>

# *Parking Management Strategies*

- Share spaces, within a parking lot and between destinations
- Use off-site parking, particularly for occasional overflow
- Reduced and more flexible requirements
- Efficiently price parking, including *unbundling* (parking is rented separately from building space) and *cash out* (commuters offered a subsidized parking space can choose the cash equivalent if they use alternative modes)
- Regulate and price to favor higher value uses
- Encouraging use of alternative modes, particularly during peak periods
- Improved walking conditions, to expand the parking facilities that serve a destination
- Improved user information so travelers can determine their travel and parking options
- Improved parking facility design



# *Comparing Benefits*

Planning Objectives		Parking Supply Expansion	Parking & Mobility Management
Reduce parking congestion		✓	✓
Generates revenue			✓
Traffic congestion reduction			✓
Consumer cost savings			✓
Improve mobility options			✓
Improve traffic safety			✓
Energy conservation			✓
Pollution reduction			✓
Land use objectives			✓
Public fitness & health			✓



# *Particularly Beneficial*

- Downtowns and other activity centers
- Urban infill
- Transit oriented development
- Walkable districts
- Affordable housing
- In conjunction with mobility management and smart growth
- To support environmental and social objectives
- Large special events
- In resort communities



# *Shared Parking*



**Parking spaces are shared by multiple users, increasing efficiency:**

- On-street parking
- Public off-street parking
- In lieu funding of public facilities as alternative to on-site requirements.

# *Regulate Parking*



Manage and regulate the most convenient spaces to favor higher-value trips.

- Duration (e.g. 60-minute maximum).
- Time (e.g., no parking 9am-5pm).
- Type of Use (deliveries, taxis)
- User Type (customers, residents, disabled users).



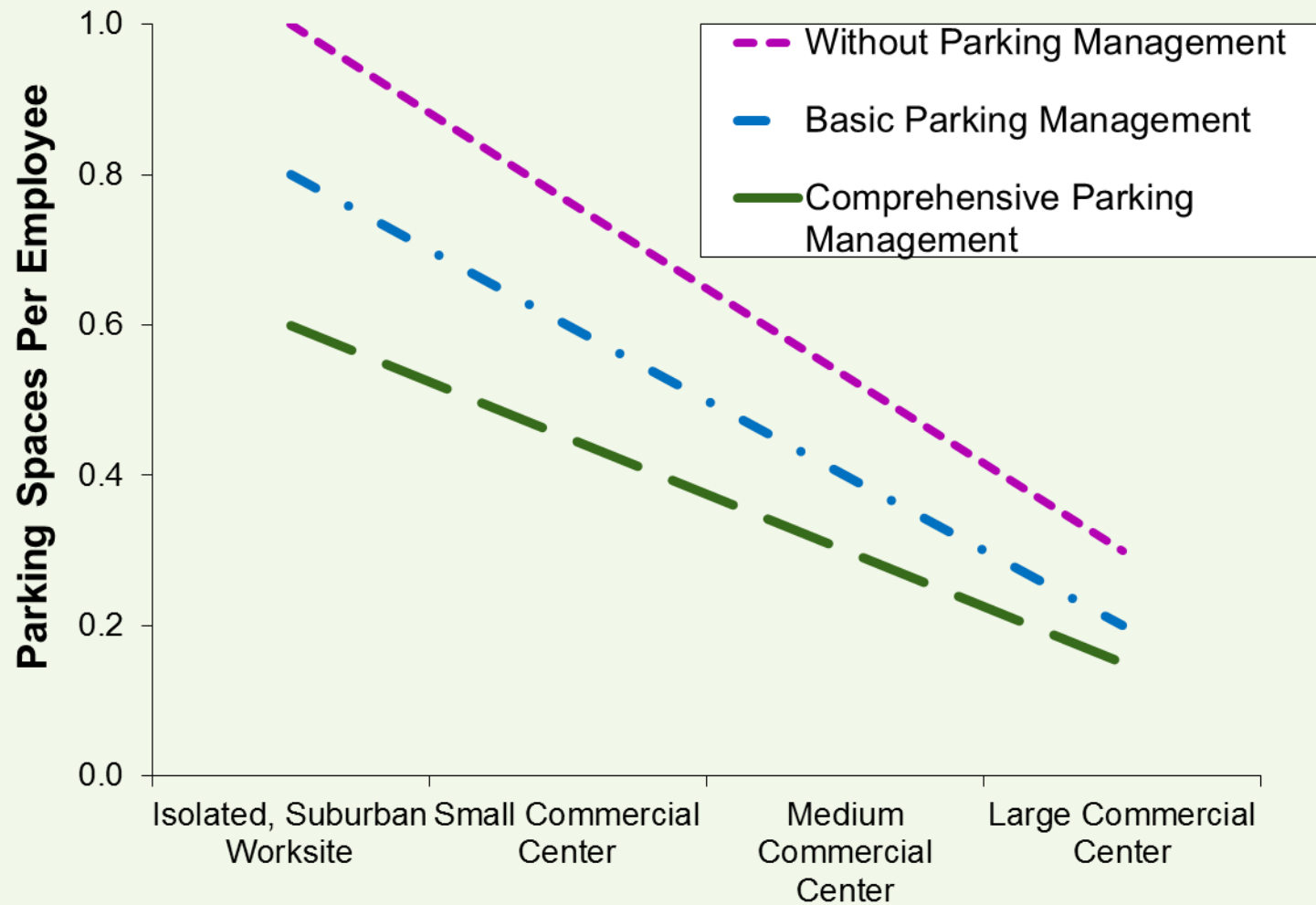
# *More Accurate Standards*



Reduce or adjust requirements to more accurately reflect demand at a particular location, taking into account geographic, demographic and economic factors.

# *More Accurate Standards*

Parking management can reduce the number of parking spaces needed in a particular situation



# *Adjustment Factors*



## **Adjustment Factors:**

- Residential and employment density
- Land use mix
- Transit accessibility
- Carsharing
- Walkability
- Cycling facilities
- Demographics (age, employment, income, etc.)
- Pricing
- Parking & mobility management
- Proximity to overflow parking



# *Remote and Overflow Parking*



- Encouraging longer-term parkers (e.g., employees) to use less-convenient, off-site parking, so more convenient spaces are available for priority users (e.g. customers).
- Negotiate sharing agreements for offsite, overflow parking.
- Provide directions to offsite parking facilities.

# *Improve User Information*

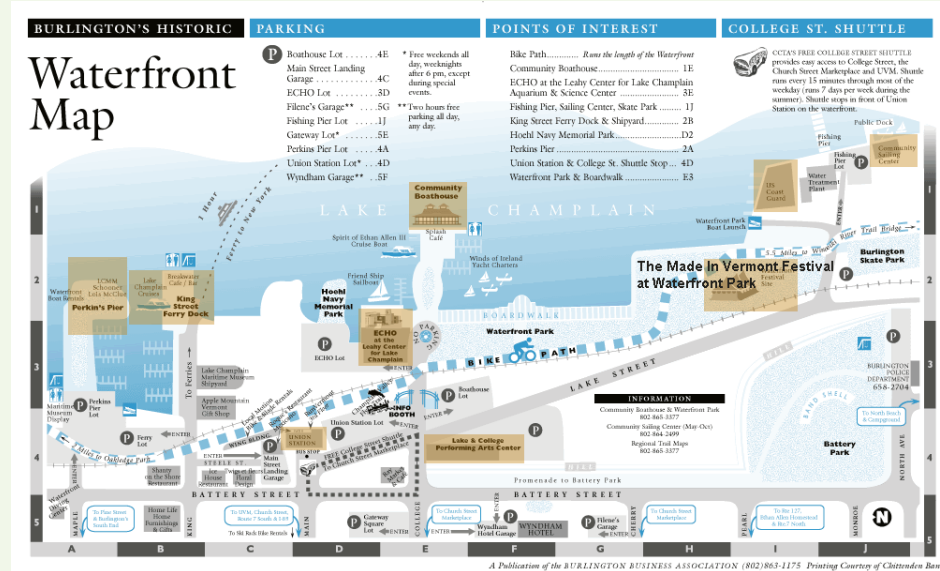
Provide convenient information on parking availability and price, using maps, signs, brochures and electronic communication.





# Improve User Information

Whenever you indicate that parking is prohibited, also indicate where parking is available.





# *Pricing*

Parking is never really free, consumers either pay directly or indirectly. Paying directly tends to be more fair and efficient, and typically reduces parking demand about 20%.



# *Efficient Prices*

- Set to achieve maximum 85% occupancy.
- Vary by location and time.
- Adjusted as needed to reflect changing demands.
- Motorists can choose between cheaper but less convenient, and premium service and priced parking.
- Motorists pay for just the amount of time they are parked.





# *Improve Pricing Methods*

- Multiple payment options (coins, bills, credit cards, debt cards, cell phone payments).
- Charge only for the amount of time parked.
- Are easy to understand and use.
- Enforcement is respectful and friendly.





# *Unbundle Parking*



Rent and sell parking spaces separately from building units. For example, rather than renting an apartment with two free parking spaces for \$1,000 per month, rent the unit for \$800, and each parking space for \$100 per month.

# *Smart Growth (Density, Design, Diversity)*

- More **compact**, infill development.
- **Mixed, urban village** development
- Increased transport **connectivity**.
- Improved **walkability**.
- Increased transportation **diversity**.
- Reduced parking supply and better parking **management**.
- Improved **public realm**.
- **Traffic calming** and speed control.





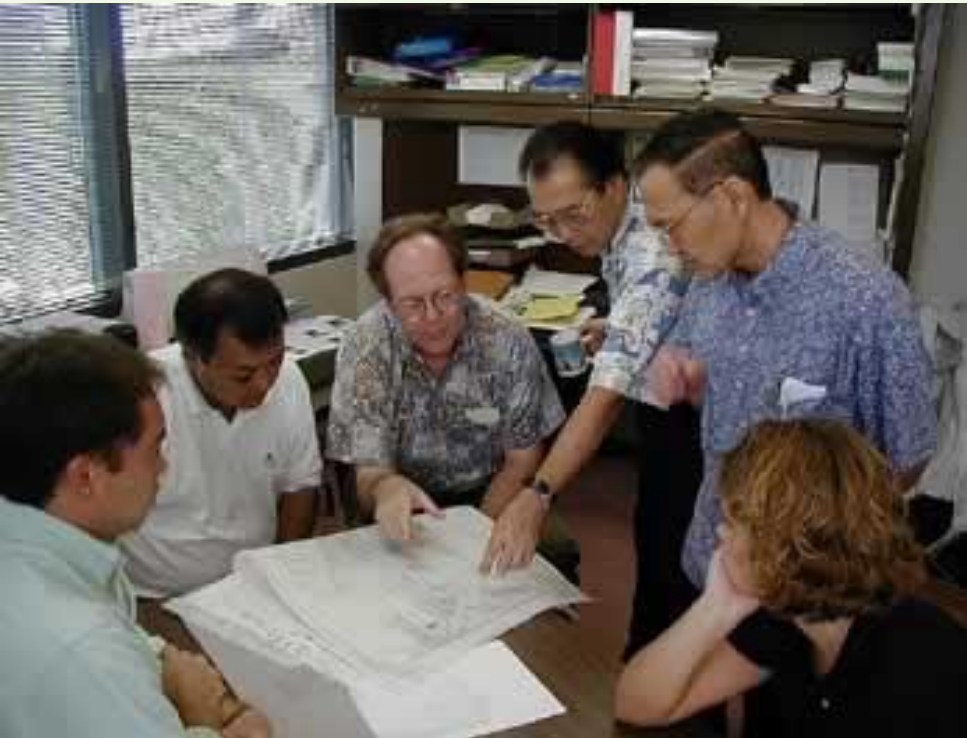
# *Location-Efficient Development*



- Locate affordable housing in accessible areas (near services and jobs, walkable, public transit).
- Diverse, affordable housing options (secondary suites, rooms over shops, loft apartments).
- Reduced parking requirements.
- Reduces property taxes and utility fees for clustered and infill housing.



# *Employee Trip Reduction Programs*



Employers encourage employees to walk, bicycle, carpool, ride transit and telework rather than drive to work.

# *Transportation Management Associations*



*Transportation Management Associations* (TMAs) are private, non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, mall, medical center or industrial park.

TMAs provide an institutional framework for implementing Mobility Management.

# *Encourage Alternative Modes*

Encourage commuters to walk, bicycle, carpool, ride transit and telework rather than drive every day to work.





# *Attracting Discretionary Riders*

- Quality service (convenient, fast, comfortable).
- Low fares.
- Support (walkable communities, park & ride facilities, commute trip reduction programs).
- Convenient information.
- Parking pricing or “cash out”.
- Integrated with special events.
- Positive Image.



# *Improve Walkability*

## **Improved walking conditions:**

- Expands the range of parking spaces that serves a destination, increasing its functional supply.
- Allows more “park once” trips, so customers leave their vehicle in a central location and walk to various destinations, reducing the total number of parking spaces needed.
- Allows walking and transit trips to substitute for driving, reducing parking demand.



# *Bicycle Parking*

- Allow bicycle parking and changing facilities to substitute for a portion of automobile parking.
- Mandate minimum bicycle parking.
- Include a combination of short-term and long-term bicycle parking.





# *Carsharing*

- Automobile rental services intended to substitute for private vehicle ownership.
- Each carshare vehicle replaces 5 to 10 privately owned vehicles



# *Better Use of Existing Supply*

- Spaces for smaller vehicles and motorcycles.
- Angled rather than parallel curb parking.
- Car stackers.
- Valet parking.
- Use currently unused spaces.
- Flexible spaces.



# *Address Negative Impacts*

- Develop overflow parking plan to address occasional peaks.
- Address specific spillover problems.
- Improve user information.
- Improve enforcement.
- Design parking facilities to fit well into their environment.
- Improve relations with neighbors.
- Compensate for spillover impacts.





# *Improve Enforcement and Control*

- Frequent
- Effective
- Considerate



# *Contingency-Based Planning*



*Contingency-Based Planning* deals with uncertainty by identifying specific responses to possible future conditions.

Strategy	Typical Parking Reduction	Traffic Reduction
Shared Parking	10-30%	
Parking Regulations	10-30%	
More Accurate Standards	10-30%	
Parking Maximums	10-30%	
Remote Parking	10-30%	
Smart Growth/TOD	10-30%	✓
Walking and cycling Improvements	5-15%	✓
Increase Existing Facility Capacity	5-15%	
Mobility Management	10-30%	✓
Parking Pricing	10-30%	✓
Financial Incentives	10-30%	✓
Unbundle Parking	10-30%	✓
Parking Tax Reform	5-15%	✓
Bicycle Facilities	5-15%	✓
Improve User Information	5-15%	✓
Improve Enforcement	Varies	
Parking Facility Design & Operation	Varies	
Contingency-Based Planning	Varies	

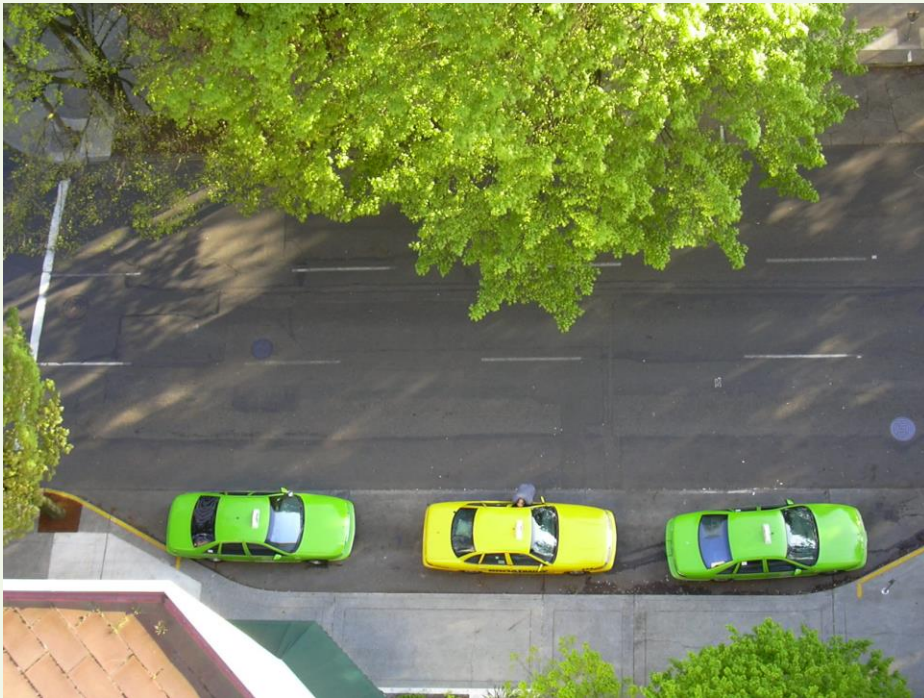


# *Significant Benefits*

Improved management typically reduces parking supply 20-60% compared with what conventional planning requires, without reducing user convenience or total costs.



# *Changes Required*



- Change the way we think about and solve parking problems.
- New zoning codes and development practices.
- New organizational relationships to provide parking management and brokerage services.

# *Integrated Parking Management*

Implement parking management as a package, including suitable positive incentives to reward people for more efficient parking behavior: cost savings, improved street environment, improved parking options.





# *Positive Messages*

Parking management is a great product! We now have plenty of evidence concerning its economic, social and environmental benefits.

However, many benefits are often overlooked or undervalued. We can better communicate the full benefits of more efficient parking management, and addressing myths and fears that discourage innovations.

We must answer the question,  
***“What’s in it for me?”***



# *Example - Old Pasadena*

The city proposed pricing on-street parking to increase turnover and make spaces available to customers. Local merchants initially opposed the idea. As a compromise, the city agreed to dedicate revenues to improving downtown public facilities and services. In 1993 a Parking Meter Zone (PMZ) was established within revenues invested in.

- Street furniture
- Trees
- Police patrols
- Better street lighting,
- More street and sidewalk cleaning
- Pedestrian facility improvements
- Downtown marketing



# Example - Seattle

## Seattle Parking Management website:

- Begins with the question, "How May We Serve You?"
- Discusses parking management concepts.
- Describes management strategies suitable for various areas (business districts, residential areas, etc.).
- Identifies how residents and businesses can initiate changes.
- Answers common questions concerning parking issues.
- Provides parking regulation and enforcement information.
- Offers instructions on using new parking payment systems.
- Includes various parking planning documents, including *Your Guide To Parking Management*.



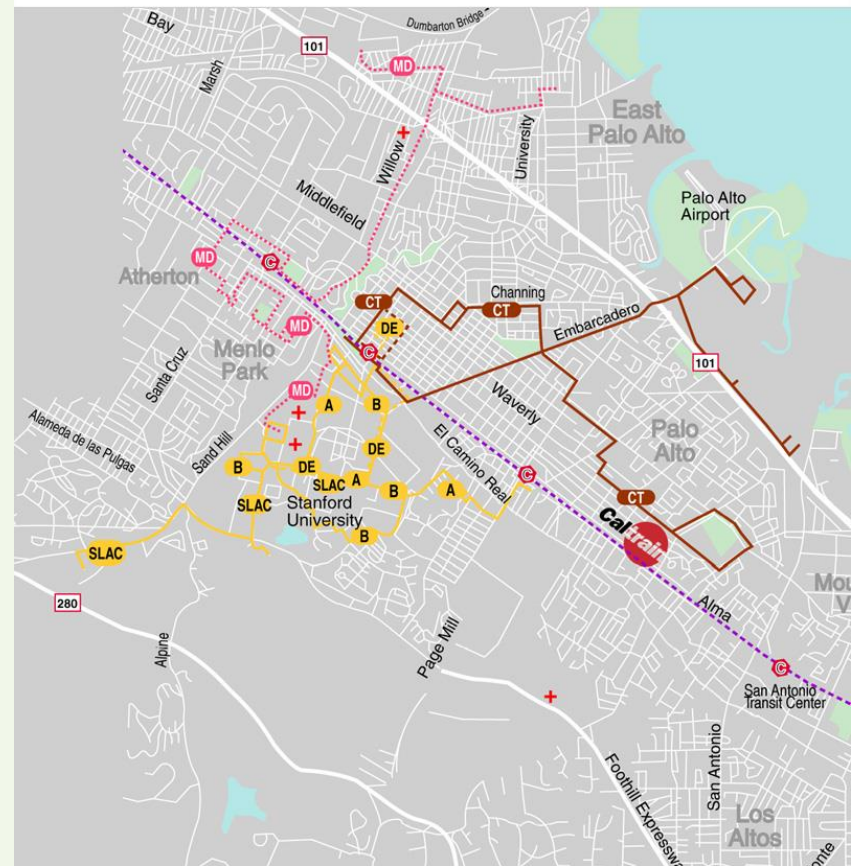


# *Stanford University*

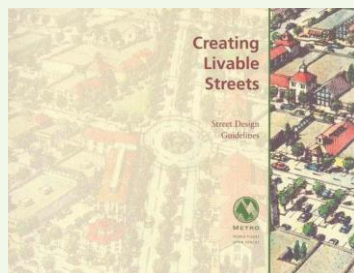
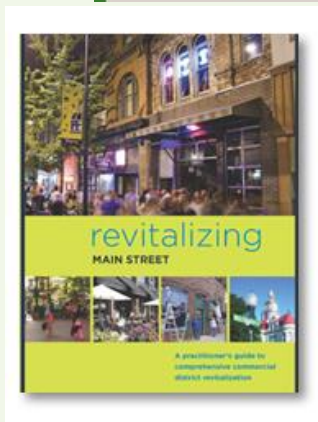
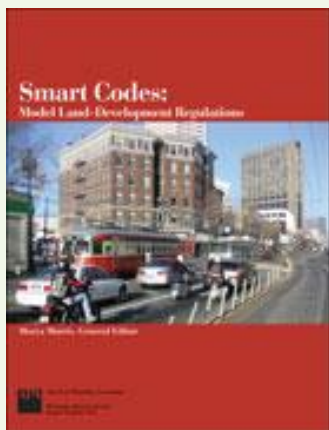
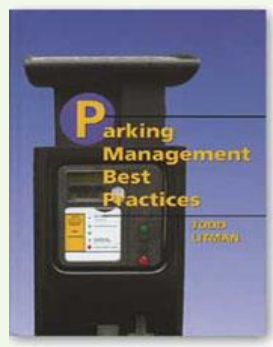
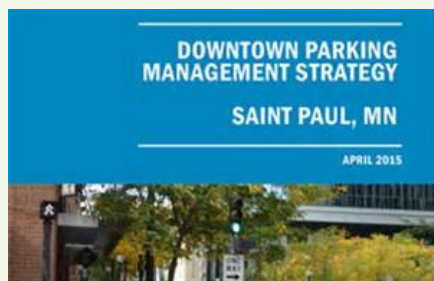
**Adding more than 2.3 million square feet of building space without increasing peak period vehicle traffic. Plan includes:**

- A 1.5 mile transit mall.
- Free transit system with timed transfers to rail.
- Bicycle network.
- Staff parking “cash-out”.
- Ridesharing program.
- Other transportation demand management elements.

## **Cities & Stanford Local Services**



# *Supported by Professional Organizations*



- Institute of Transportation Engineers
- Planning Institutes
- Federal, regional and local transport agencies
- Development and business organizations
- And much more...



**“Parking Management Strategies, Evaluation and Planning”**

**“Parking Requirement Impacts On Housing Affordability”**

**“Parking Taxes: Options and Implementation”**

**“Transportation Cost and Benefit Analysis”**

**“Parking Management Best Practices”**

**“Online TDM Encyclopedia”**

**“Selling Smart Growth”**

**and more...**

**[www.vtpi.org](http://www.vtpi.org)**